

Chapter 16

Shelter From The Storm

I had just finished a talk before a downtown luncheon club and had invited questions. A matronly lady arose. "I would rather die under The Bomb than spend weeks in a bomb shelter," she announced. I decided immediately to demolish her preconceived notions with humor.

"Madam," I inquired, "have you ever been to the Hungry Eye?" The Hungry Eye was a well-known bistro in San Francisco where Mort Saul would come out with his rolled-up newspaper and make droll remarks about whomever and whatever was in the news. "Of course," she replied. I proceeded, "Well, you have to go down one flight to enter the Hungry Eye just as you do in a shelter. We give you a little more room in the shelter than you get at the Hungry Eye, but think of the shelter as going down one flight into a darkened crowded room to sit around with your friends and neighbors." There was an appreciative titter from the audience.

"Of course, you are likely to get hungry, sooner or later," I continued. "We've thought of that. We are going to stock peanuts in your shelter." I had discussed during the talk our research and how peanuts were nearly a perfect balanced source of protein, fat, and carbohydrate. "So think of the shelter as going down one flight into a darkened crowded room and sitting around with your friends and neighbors eating peanuts." The room hummed. I was also getting across the point that the shelter would not be full of strangers but rather your neighbors or fellow-workers.

"Of course," I continued, "As you ate peanuts, you would get thirsty. We've thought of that. We have placed a tank alongside the shelter and for you we are going to fill it with Anchor Steam Beer." Anchor Steam was another San Francisco tradition along with the Hungry Eye. "So, madam, think about shelter as going down one flight into a darkened crowded room with your friends and neighbors and sitting around eating peanuts and drinking beer. Have you heard of 'Ten Nights in a Barroom?' Well, this is 14 days!" The audience roared its appreciation.

Why Fourteen Days?

I felt good about that response and used the incident in other talks in later years. But the underlying attitude represented by the matron's rather extreme statement worried me. The lady was not alone. Anti-defense activists scoffed at the idea of shelter against nuclear attack. Even government officials had doubts that "effete Americans" could stand up psychologically to an extended stay in a crowded shelter. The doubts extended all the way up to President Eisenhower, according to my contacts in the Federal Civil Defense Administration (FCDA).

Two weeks in shelter was a planning assumption for those of us engaged in nuclear defense. It had, of course, been mentioned to the press where it was presented as a requirement rather than a limit. The "magic number," 14 days, comes from an assessment of the way that the radiation threat diminishes with time after a nuclear explosion. The fission products resulting from the explosion are dominated initially by a multitude of short-half-life isotopes that produce a very high radiation level. As these isotopes are used up, the intensity of radiation decreases rapidly. The

remaining radioactive isotopes become those of longer and longer half-life and radiological decay becomes slower and slower. The FCDA had promulgated the “Seven-Ten Rule” as an approximation of the behavior of radiological decay. The rule stated that the threat was reduced by a factor of ten for each seven-fold passage of time. For example, consider the intensity of radiation at one hour after the detonation. After seven hours, the threat would be one-tenth its one-hour level. Seven times seven or 49 hours after the explosion, the threat would be one-hundredth of its level at one hour. Forty-nine hours is about two days. Seven times two days is two weeks. Thus, at two weeks the rate would be one-thousandth of that at one hour.

How long before another factor of ten reduction? Fourteen weeks! Over three months after the attack! Too long! Two weeks was about as long as would seem reasonable. Also, the highest level of fallout that we expected to see was about 3,000 R/hr at one hour after burst. At two weeks, the level would be 3 R/hr, not a situation that you would want to live in indefinitely but one permitting evacuation to a less threatening environment. Most of the fallout area would be at markedly lower risk and a safe area would not be far distant. For both reasons, two weeks in shelter was a reasonable limit. Most shelter stays would not be nearly that long.

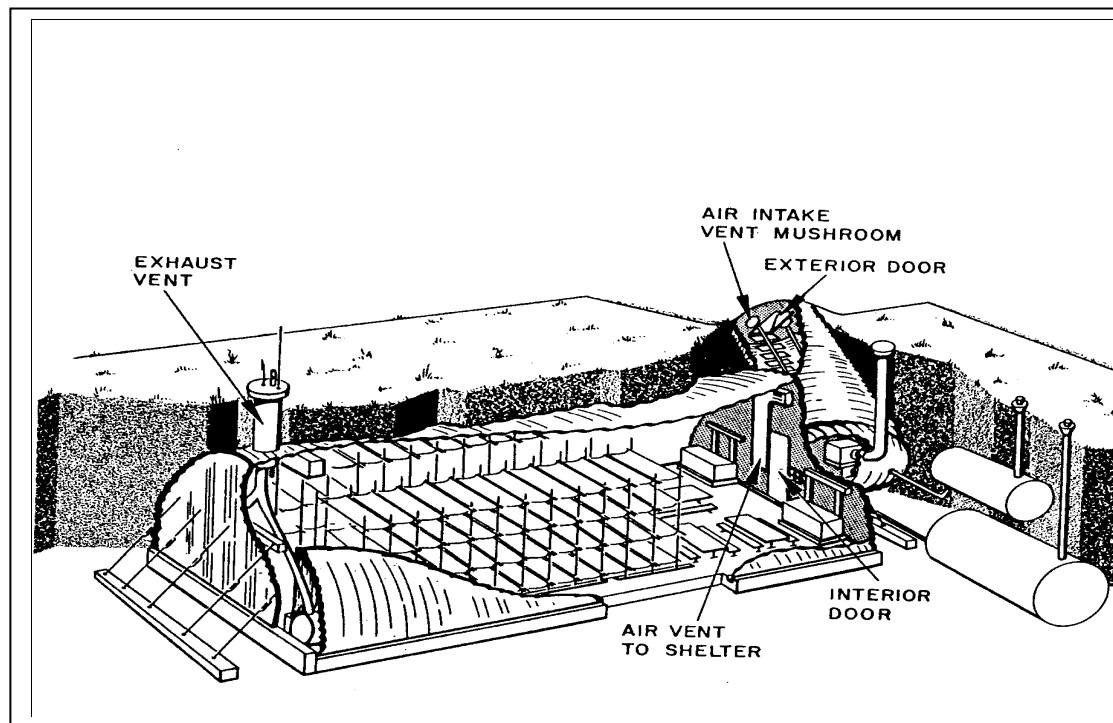
The need to wait out the fallout threat not only raised the issue of psychological feasibility. It raised the issue of shelter stocking to provide water, food, and sanitary facilities. During World War II, Londoners could retire to the subway stations upon the warning alert and stay until the all clear sounded—usually only a few hours or overnight. Nuclear weapons changed all that. People might have to live in shelters for days or perhaps weeks. At NRDL, I pushed enthusiastically into research on the problems of shelter living. There were plenty of problems. A basic assumption was that population shelter had to be inexpensive. The average family couldn’t afford much even if they were worried about nuclear war. Besides, the government was responsible for the common defense, wasn’t it? There were 200 million people in the country. Unless the per capita cost of shelter was kept reasonably low, a national shelter program could be out of the question.

The NRDL Shelter

I got started in shelter design because it was a lot like designing a ship. The two were similar in that you had to plan to take care of the passengers without help from the outside. As a ship had to take its people across the hazardous seas to a safe harbor, the shelter had to take its people through the war and safely into the postattack world. I knew what shelter shell I liked. It was the flexible steel arch that the Navy’s Bureau of Yards and Docks had tested at Operations BUSTER-JANGLE and UPSHOT-KNOTHOLE at the Nevada Test Site. It was a standard Navy ammunition storage magazine buried beneath three feet of earth. But the test units were not suitable for use by people. The entrance was a vertical pipe and the interior was empty except for measuring devices.

As a minor in-house project, I sat down with Lou Porteous and a couple more of my design engineers and roughed out how we would make a working shelter out of the BuDocks shelter. We put a door in the center of one end. Outside the door we bolted an 6-ft diameter corrugated steel tube about 10 feet long. From there we angled another tube up to the surface. At the top, we welded a bulging blast-resistant plate containing a Navy-type door and two capped intake venti-

lators. People would enter through the blast door, walk down a stairs, make a turn and walk past the engine-generator to the door into the shelter. We put the generator, which provided power for lights and ventilation, in the entrance tunnel because we thought it would be too noisy and smelly in the shelter itself.



The NRDL Shelter

Also, the generator would take up space in the shelter and we didn't have any to spare. The flexible arch shelter was only 25 feet wide and 48 feet long, That's 1200 square feet. There was no agreement on how much space to provide per person so I arbitrarily decided it would hold 100 people, 12 square feet per person. Most thinking at the time allocated much more space but I was well aware of the need to avoid expensive solutions and my training as a naval architect led me to think small. Of course, we not only needed space for people. We had to provide water, food, and sanitation facilities at a minimum. We solved the water problem by burying a tank alongside the shelter. Drinking water flowed by gravity to a tap in the shelter. The food, however, had to be stowed in the shelter.

We tried the old tank-outside trick for the sanitary facility but that turned out to be too difficult to do. So we put two big horizontal tanks at the far end of the shelter, one on each side, one for the boys and one for the girls. The tanks were about six feet long with two toilet seats on top, wood steps up and curtains for privacy. Sort of huge Porta-Potties, you know. We put the exhaust ventilator at the far end also and vented the potty tanks up into it. We made the exhaust vent big enough so it could become an emergency escape hatch if the entrance got jammed up for some reason.

With the toilet system in place, there was only about forty feet of shelter left for the people to live in—and, oh yes, store the food, too. Should the shelterees sleep on the floor? On pads? In shifts? My naval architectural training took over. I started out with a hammock idea that shifted to canvas bunks side by side. We ended up with 12 bunks four high on each side taking up 28 feet of the remaining shelter space. There wasn't much room left but the bunks were demountable without tools so they could be taken down when not in use to provide more living space. We stowed the food along the entrance wall and provided folding tables and chairs sufficient for half the people to eat together at one time.

Almost by magic a scale model of the shelter appeared in late 1956. A portion of the earth cover and shelter shell had been stripped away on one side to show the “hotel package” of bunks and tables inside. I was entranced and soon was briefing Paul Tompkins and Captain Hinnens on the “NRDL Shelter.”

“How much would it cost?” asked Paul after I had explained all the features, using the model. “About a hundred dollars per person,” I replied. “Including the furnishings and two weeks of food?” asked Hinnens. “We think so,” I answered, crossing my fingers behind my back.

This briefing took place just a month or so after the three of us had testified in Los Angeles before the House Military Operations Subcommittee chaired by Chet Holifield. We had scored a big hit there. Also, Captain Bob Hinnens and Scientific Director Paul Tompkins had learned that Congressman Holifield was enthusiastic about shelters and was pushing the Eisenhower Administration to embark on a national shelter-building program. What none of us knew was that FCDA, which would have responsibility for such a program, was about to propose a shelter-building program to the President.

Meanwhile, however, NRDL's Commanding Officer and its Scientific Director encouraged me to develop detailed drawings and a cost analysis of the NRDL shelter. They also started scheduling briefings on the shelter as the basis for a nationwide program. I gave several of these briefings to visiting VIPs in late 1956. One day in February 1957, Captain Hinnens scheduled a full-blown press briefing. Only one reporter showed up but he was impressed by the scale model and asked many questions. The next day his paper ran a front-page story headlined: H SHELTER DEVELOPED HERE. The subhead read: Navy Claims 99% Survival. There was a picture of the scale model with me pointing out a feature to Paul Tompkins, Gene Cooper, and Don Campbell. The story was apparently picked up in the East because very shortly I was called by a representative from the FCDA.

The Shelter is Built

The call was from an FCDA engineer named Ben Taylor. He asked a number of questions about the shelter structure. In answering these questions, I also pointed out that we were going to occupy such a shelter close to the ground zero of Shot Diablo in the upcoming nuclear test series at Nevada Proving Ground and he would have an opportunity to look at an example there. (See Chapter 14.)

Months later, indeed, after the Diablo shelter test, another FCDA engineer came to visit me at the Laboratory. His name was Wayne Johnson. I gave him the standard pitch on the NRDL shelter using the scale model. He seemed impressed with the design but came back repeatedly to the matter of cost. How did we know that it could be installed and outfitted for \$100 per person. With a purported capacity of 100 persons, that was only \$10,000 for the whole job. (Of course, \$10,000 bought a lot more back in the 1950s than it does today!) Finally, I told him that if he didn't believe our cost estimate he should get us the money to build one to prove it.

That turned out to be the easy part. It seemed that FCDA had received a small pot of money from Congress for "demonstration projects" and, although most of this money was used to obtain the backing of politically important congressmen, State Governors, and the like, FCDA could and would support a shelter demonstration project. I also think now that FCDA wanted very much to sponsor work at NRDL because the Holifield Committee had berated them several times for ignoring us. So, FCDA agreed to pay for the shelter construction if we provided the place to put it. That was easy too as NRDL already was doing a lot of field work at Camp Parks, a mothballed Army base in the east Bay near Livermore. We got permission to build the NRDL shelter there.

The hard part was designing a research project that would establish incontrovertibly the shelter cost. It would not be enough just to formalize the specifications and go out for construction bids. Because of the unusual nature of the construction, the bid prices, even the lowest one, were likely to be substantially above our \$10,000 goal. Moreover, we were only building one shelter whereas the cost data would be applied to a program to build many such shelters; say, under school playgrounds. A big part of any construction cost is the cost of "mobilization," assembling the digging equipment, the cranes, and the crews to do the job. That cost could be spread over many shelters in the real building program. Our research project had to separate out that kind of cost.

There was another aspect of costing of which I became aware. If many items of a complex nature are made by a single group, the first one—the prototype—costs the most. Additional copies cost less and less. This is known as the "learning curve," which was well-established in the aircraft industry. Our job would be a prototype and we were well aware that if it cost a bit more than \$10,000, the program engineers would take this into account. Nonetheless, we needed actual costs and not what a construction company would add on to cover its uncertainties. I had tried to determine how much it actually cost Holmes and Narver to build the one at the Nevada Proving Grounds but the records were too poor for the purpose. Attempting to solve this problem took most of 1958.

The bid package we came up with was perhaps one of its kind. We asked for bids for an "experimental construction project" in which the bidder was not only to acquire the materials and install and furnish the shelter (with the usual incentives and penalties for prompt or laggard completion) but also to keep accurate records of all costs of labor and materials under the watchful eye of the auditor. At the bidders conference, there were strong objections from a couple of potential bidders because the record keeping would reveal how much they actually profited from the contract. "Yes," I agreed, "but we don't care how much you profit. The low bidder will get the job and will be paid the contracted price no matter what." The source of the anxiety was the

stories in the papers about the big defense contractors getting sued by the Government for “excess profits” made during the Korean war buildup.

We must have been convincing because we got several bids. The low bidder was selected early in 1959. Work started shortly at Camp Parks. Meanwhile, I put my feet on my desk and thought about the next step. Soon, I would have a shelter in the ground at Camp Parks. No matter how the cost data came out, there would be a real shelter there. What could I do with it? Test it? Against what? The Budocks group had tested shelters like it against high blast overpressures in Nevada and I had led a crew of 17 in a similar one less than a mile from ground zero in the PLUMBBOB Diablo shot. We also determined at that time all we needed to know about its fall-out protection.

Fire! We didn’t know whether people in such shelters could survive a mass fire surrounding the shelter. I put that question on my list of things to do (which we eventually did) but I kept coming back to the question of whether ordinary people could survive in a crowded shelter for as long as two weeks. I really wanted to be the shelter leader in such an experiment in shelter living. I had a lot of ideas on the problem of managing a public shelter that I would like to try out but where could you find 100 ordinary people willing to spend two weeks in an underground shelter?

I discussed the matter of a two-week shelter occupancy test with Paul Tompkins and Associate Scientific Director Gene Cooper several times over the next few months. If we could get FCDA to pay for it, we could put an ad in the San Francisco newspapers and pay people to participate. How much should we pay them? What if some defected before the two weeks were up? Would they be paid anything? A partial payment, maybe? I worried that paying people to live in the shelter would compromise the validity of the experiment.

When the shelter was completed and equipped, I went out to Camp Parks to inspect it. It really looked great to me. Afterward, I stood outside the shelter entrance in the April afternoon sun, gazing around at the buttoned up buildings in the mothballed camp. Over in the distance I could see men in blue denims bent over pulling weeds in a field of cabbages. “Who are those people?” I asked. “That’s the Alameda County prison farm,” replied Ray Heiskell. “Those are some of the prisoners.” Now I could see a guard with a shotgun. A thought flashed through my mind. “I wonder. . .”

The Occupants are Assembled

I tossed around the prisoner idea. They weren’t doing anything. Two weeks in the shelter wouldn’t be any worse than being in jail, would it? Lots of medical research had been done with the aid of volunteer prisoners. An occupancy experiment would not have the risks inherent in most medical research either. I decided to explore the possibility.

I quickly established that there were several hundred men incarcerated at the Alameda County Prison Farm, which was actually called the Santa Rita Rehabilitation Center. These prisoners were not hardened criminals. They had been convicted of misdemeanors, not felonies. The tougher nuts were kept in the jail or sent to San Quentin. These were alcoholics drying out, ex-husbands behind in their support payments, and the like. I found this out by talking to the Ala-

meda County deputy civil defense director, a gentleman by the name of Bill Hildebrand. Once I clued him in on the project, Bill did all the negotiating with the Sheriff, who was also the county's civil defense director, and other officials whose agreement was needed.

Hildebrand arranged for me to have an interview with the senior deputy who was in charge of the jail and the prison farm. It was immediately evident to me that the deputy was favorably inclined to allow me access to the farm inmates. I told him about the importance of the experiment and that I only wanted volunteers who were not offered any inducements such as additional time off. He readily agreed. I made a tentative appointment to address the inmates of the farm about two weeks later.

Back at NRDL, I filled in Paul Tompkins and Captain McQuilken, the Lab's CO at the time. They approved of my approach but brought me back to bottom line. "Is FCDA going to pay for all this?" asked Paul. "It's not going to be cheap." McQuilken had a different thought. "I think we will have to get permission from Washington for any sort of experiment on human beings," he said. I could see that I had better spend a little time on what I considered to be purely bureaucratic hurdles before I talked to the county prisoners.

The hurdles were not that high. The responsible Navy organization was the Bureau of Medicine and Surgery. They would seek approval from an interagency committee. BuMed was a sponsor of the laboratory; indeed, the main source of funding for the Biomedical Division. Their liaison officer at NRDL was a distinguished physician, Captain Harry Etter, who was slated to go back to headquarters in Washington as a Rear Admiral on his next tour of duty. When word came that we would need to have a doctor in the shelter at all times if we were to obtain approval, Harry jumped at the chance to participate. Shortly, the approval of the experiment was in hand.

I made arrangements to speak to the inmates of the prison farm. I don't have a record of what I said but I believe I emphasized the importance of the experiment to the defense of the country and its citizens—an opportunity for the prisoners to do something they could be proud of for the rest of their lives. I must have pushed the right buttons because the vast majority of inmates volunteered to participate. I had an abundant source of shelterees.

The Research Plan Matures

The other hurdle—FCDA support—took an unexpected turn. For one thing, FCDA got reorganized and combined with the Office of Defense Mobilization (ODM). The new agency initially was called the Office of Defence and Civil Mobilization and when the powers-that-be realized that didn't make sense it became the Office of Civil and Defense Mobilization (OCDM). After having survived several months of chaos, I bumped into the fact that FCDA/OCDM had a small but well-designed research program, including work on problems of living in group shelters. For this work, they had turned to social scientists, including a small contract with the American Institutes for Research (AIR), a not-for-profit concern based in Pittsburgh, PA. AIR was doing their in-shelter research. Wayne Johnson was apologetic. AIR didn't have a real shelter. They used a windowless room in their lab. They had room for perhaps 25 people. And they had to hire their shelterees for each experiment. How many experiments had they done? Well, they were just get-

ting started. “Why,” I asked, “don’t you send their social scientists out here to make their observations on 100 people in a real shelter?”

The proposal made sense back at OCDM and in a matter of days the AIR researcher, a behavioral scientist named Robert Goldbeck, arrived to inspect the shelter and collaborate on the experiment. Goldbeck was the first social scientist I had an opportunity to work with. All those at NRDL were “hard” scientists—physicists, chemists, biologists, and engineers. Goldbeck brought an expertise and a point of view that I didn’t know was missing until we began to discuss the proposed experiment. In a matter of days, the procedures were fleshed out in a convincingly satisfying way.

We installed video cameras and microphones in the shelter. The monitor screen and speaker were placed in the control shack we had built on top of the buried shelter to house our equipment for measuring the temperature and humidity in the shelter. To identify the shelterees, we got 100 plain dish towels, cut a hole in the middle through which to stick one’s head, and stenciled big numbers front and back. Actually, we used letters and numbers. Ten groups of ten each used the letter from A through K. (The letter I was not used, for obvious reasons.) As the shelter commander, I was number A1. My deputy, Army Captain Joe Sheard, was A2 and Dr. Harry Etter was A3. Santa Rita insisted on including four deputy sheriffs along with the volunteers. That took care of A4 through A7. And then there was Bill Hildebrand, who wasn’t about to be left out of this show. He was A8. To this core were to be added 92 volunteer inmates from the prison farm.

We carefully laid out the in-shelter program and daily schedules from entering the shelter to the final ceremony before leaving it two weeks later. I sensed that Bob Goldbeck was unhappy that I was going to be the shelter leader. As a behavioral scientist, he would have been delighted to dump a hundred strangers into the shelter so he could observe how they went about creating order out of chaos—if they ever did. I, on the other hand, was contemptuous of the FCDA \OCDM policy of avoiding any military flavor to their terminology and procedures. They called the shelter leader a “shelter manager.” They planned for the sheltered population to elect representatives to present complaints to the shelter manager and they called them “stewards” just like the unions in industry. Talk about “business as usual!” I called the shelter leader a “shelter commander.” After all, if shelters would ever be used, there would be a war on. Civil defense, I argued, was a wartime function and should be treated that way. Training shelter managers should be a top priority and just in case one wasn’t available, there ought to be a leader’s manual stocked in the shelter. I had a pretty good idea of what should be in that manual and I was going to run this shelter test as if it existed. Besides, this was the first large shelter habitability test and I was responsible for the safety of those participating. There would be, I believed, opportunities later for experiments with a less dominant shelter leader. (In the 1960s, several thousand people took part in such shelter experiences.)

When our research design was complete, we felt the need for a dry run to check out all the systems and then make final adjustments. The 100-person test of two-weeks duration was scheduled for December 3rd through the 17th of 1959. We scheduled a three-day dry run for a week or so before, November 22-25. The guinea pigs were mostly volunteers from the NRDL staff, many of

them liaison officers attached to the lab. Wayne Johnson, the OCDM research coordinator, also volunteered. Seventeen of us went in on a Sunday afternoon and came out on a Wednesday. Inside, we erected the bunk system, used it and dismantled it several times, used the shelter rations, and exercised the night-time watch system. Topside, Goldbeck and his crew practiced the observation and recording routines and my team, led by Ray Heiskell, tested the habitability measurement systems. The dry run went well and by the third of December we felt we were ready.

Two Weeks Underground

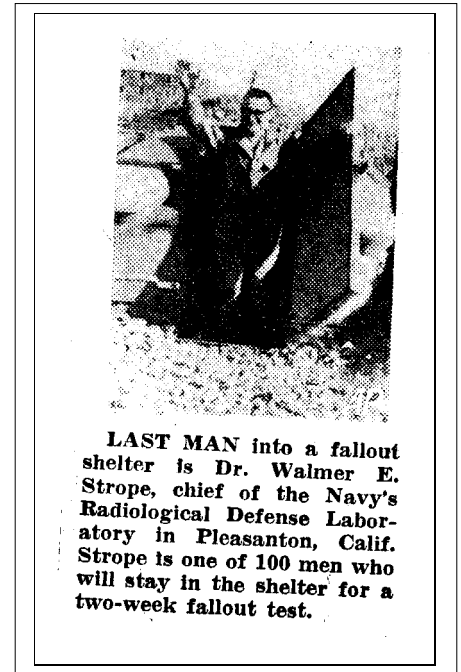
The morning of December 3, 1959, was cold and gray at the shelter at Camp Parks. The research team was there early although the volunteers from the prison farm and the deputy sheriffs that would accompany them were not due until 1 p.m. The morning went fast, however, as the team members made last minute checks of their equipment. Or was it that I subconsciously realized that shortly I would not see the light of day for two whole weeks?

After a bag lunch, I went topside to await the arrival of the inmate volunteers. I was a bit surprised to find a goodly crowd assembled. Hildebrand had arrived earlier but the Sheriff himself now was there, together with several county officials. The NRDL front office was there with a covey of Navy brass. The State civil defense director, Allan K. Jonas, led a contingent of civil defense officials from the area. And, of course, there were reporters from the newspapers and two television crews.

The volunteers from Santa Rita arrived in several buses. The head deputy gave me a bit of bad news. There were only 89 inmates on hand.

The morning medical check had determined that three of the volunteers were “ill” and we had made no provision for alternates. It was too late to do anything about that so the 100-person shelter experiment became the 97-person test by default. I stood by the shelter door with a clipboard and counted as my shelterees entered. Down below, Joe Sheard instructed them to sit in long rows on the floor. When I had established the count, I entered the door and, waving, turned to close the door. Camera lights flashed. The result was in the evening newspapers as shown above. The caption, of course, is all wrong. I was not a doctor, I was not chief of NRDL and the Lab was not near Pleasanton, only the shelter was there.

When I entered the shelter, the volunteers were seated on the concrete floor in two long rows with the five deputies standing at the far end with Dr. Etter. I joined Joe Sheard in front of the group. “I am the shelter leader,” I said. “My name is Jerry Strobe. This is Joe Sheard, my deputy. Once we get going in here it can get pretty noisy, so if you see Joe or I raise our hand over our head you stop talking and raise your hand, too. If you see hands above heads, stop talking and raise yours so others will see them. When we have something important to tell you, that’s the



only way we will be able to get your attention. OK?” I needed to get that routine established at the very start.

I next broke out the identification vests. I donned A1, gave A2 to Joe, and handed the rest of the A towels to Harry Etter and the deputies. I then asked the volunteers to band together with friends if they wished and outfitted ten with the B vests and so on. I gave them all a chance to exchange vests if they wanted to change groups and then made certain they understood that from then on they were to wear their vest at all times.

Joe and I then went into the routine we had rehearsed, pointing out the various features of the shelter and establishing rules and responsibilities as we went along: “Don’t waste water or we’ll get mighty thirsty by the end of two weeks.” “Smoking only under the exhaust ventilator.” We demonstrated how to put up the bunks and take them down. Soon it was time for the evening meal. We hadn’t settled on a shelter ration at that time. As I recall, we alternated two meals, one of peanut candy bars and the other of C-rations left over from the Korean War. Since we had tables and benches for 50 persons, we fed in two shifts, candy bars to one and C-rations to the other. After the evening meal our event schedule called for recreation. We had painted a shuffle board court on the concrete floor, which was a great success, and left several tables up for cardplayers. At 10 pm we put up the bunk system and at 10:30 dimmed the lights. Soon all were asleep except the night watch.

I enjoyed the night watch, sitting at a table with a shielded lamp, going over the next day’s schedule, talking quietly with Dr. Etter or Hildebrand or another of the deputies about this and that. We did the night shift in two 4-hour shifts: 10 to 2 and 2 to 6. Somehow I always seemed to get enough sleep. The days slipped by, powered by the event schedule. Among the things I remember was the eagerness with which the volunteers sought me out to explain why it was all a mistake that they were incarcerated. It turned out that there were thieves, alcoholics and druggies among the group, many of which sort of regarded the prison farm as home. They had become institutionalized. When their sentence was up, they went back to the “street.” I never heard them mention “home.” It was always the street that was the alternative to prison.

We had a few problems with the shelter equipment, the “hotel package.” The canvas bunk ripped between two beefy guys. The bunks were not as easy to assemble as they could have been. We had problems with the water cups. We had only 100, so each person marked his cup. But they kept getting lost or stepped on. One enterprising volunteer solved the problem by cutting holes in used food cartons to create cup storage racks. All these things were recorded to be corrected later.



On the evening of the last full day, a commotion broke out after the bunks were erected. Two deputies collared a volunteer who appeared sloppy drunk.. He was quickly transferred out of the shelter to deputies above. Dr. Etter told me shamefacedly that the man was on a drug high. “He asked me for a sleeping pill on several

nights. He must have saved them up. I never suspected that he was conning me.” So, only 96 were to leave the shelter after 14 days underground.

We were due to leave the shelter at noon on the fourteenth day. About 11 o’clock, Wayne Johnson, the OCDM liaison, and the Sheriff came down into the shelter. The Sheriff congratulated the group of volunteers and told them he was proud of them. Then, Wayne opened out a box and took out a sheaf of fancy-looking diplomas. Remarking that their patriotic feat entitled them to recognition by the Federal Government, he proceeded to call out their names while the Sheriff handed out the certificates. It was a nice gesture and one I knew nothing about. They must have been working on it for the two weeks we were underground.

At noon, I went up the steps and opened the shelter door. There was quite a crowd outside. Captain McQuilkin helped me lay the door open and extended his hand—but before he could shake my hand a flying body threw herself into my arms. DeeJay left the good Captain staring at his proffered hand. Oh well! As the shelterees began to emerge, a Navy band from Treasure Island began to play a patriotic tune and the reporters descended upon the group. It was a fitting end to the first large-scale shelter experiment.

And Now the Families

The 14-day experiment proved to some extent that people could indeed endure an extended shelter stay. We learned a lot of other things in that experiment also. By far the most important of these was that almost all of the psychological adjustment occurred in the first two days. As we confirmed in hundreds of experiments a few years later, if people were going to “defect” from the shelter they do it in the first day or two. What happens is that people settle into a routine even if it is a strange one. This finding was made by Dr. Goldbeck and his psychologists up in their topside control room. My observation came at the end of one week when, in an attempt to alleviate boredom, I proposed that we shuffle up the groups so everyone would have new people to talk to at mealtimes. This suggestion was greeted by vociferous objection so I gave it up. Not only that, I realized that everybody sat in the same place at mealtime after the first few days.

This finding was of great importance to us because it meant we could accomplish our goals by using shelter stays of a few days rather than a full two weeks. We could use volunteers from ordinary life, especially if we scheduled the experiment over a weekend. In fact, the first 14-day shelter experiment was also the last.

It took us several months to analyze the data obtained in the 14-day test. Then I started planning a family shelter test; men, women and children of all ages would be involved. But first some deficiencies in the shelter equipment and supplies had to be corrected and some new problems had to be addressed. One problem was the food. We couldn’t continue to use C-rations and the peanut candy bars were also unsatisfactory. For one thing, there weren’t enough peanuts in the country to stock a national shelter system. The lady I promised peanuts and beer would have to be satisfied with wheat or corn. I discovered Bob Olsen, a food researcher at the Western Regional Research Laboratory of the Department of Agriculture located in the East Bay. He was developing uses for bulgurized wheat and was enthused about its use in shelters. Bulgur wheat is wheat kernels that have been soaked and roasted so that they are tasty and readily digested, sort

of like puffed wheat but not so puffed. Bob had the bulgur wheat in granular form and was working on machines to form it into wafers as well.

One of the main complaints by the 14-day volunteers was the lack of chairs to sit on. We adjusted in the test by using the dining tables and benches continuously and leaving half the bunks up during the day. Looking around, we found an inventive guy named Norman Steuer who was designing furniture made of corrugated paper boxboard. These chairs and tables were much cheaper than ordinary furniture, could be stored flat and assembled when needed—"put tab A in slot B." We ordered 50 chairs and ten benches.

To test the new food diet and the cardboard furniture and many other small improvements, we decided to run one more experiment with institutionalized volunteers, a 5-day shelter stay. It was held on July 25th to 29th, 1960. I don't remember too much about it because it was much like the 14-day stay. The bulgur wheat food was quite satisfactory but the 50 cardboard chairs all failed before the end of the second day. The problem was twofold. The tabs were not locked into the slots sufficiently and the boxboard used was not of sufficient bursting strength. This was all corrected by the time of the family occupancy test.

When I felt we were finally ready, I set the time of the family test for November 4th through 6th, 1960. It would occupy two nights and most of three days in shelter. Volunteers were sought from families of NRDL staff and the staff of OCDM Region VII in Santa Rosa. A call for volunteers at NRDL resulted in 105 volunteers. I briefed the staff at Santa Rosa on October 12th and got 31 volunteers. In addition, Allan K. Jonas, California's civil defense head, volunteered along with his wife and 12-year-old daughter. Of these volunteers, 92 were selected to meet the following criteria: (1) half male and half female, (2) half adults and half children, (3) children equally divided among pre-schoolers, elementary-schoolers, and teenagers, (4) a range of family size from singles to large families, and (5) extreme age range, if possible. In addition to the 92 volunteers, there were eight members of the experimental team, including myself. Don Schultze was my deputy and Harry Etter was the physician. Lt(jg) Perry handled in-shelter environmental measurements. Mr. and Mrs. Howard Huey, Navy hospital corpsmen, helped Harry Etter. Cdr. Katherine Kendall RN from the Public Health Service joined us to help with problems of infant, child, and female care. Finally, Eleanor Taylor from Bob Olsen's bulgur wheat team supervised the food preparation and service.

The experimental wheat product was now in the form of a wafer that could be eaten out of hand, spread with jam or peanut butter (or both!), could be crumbled and served with milk and sugar as a breakfast food, or could be crumbled and served with hot soup, sauce, or gravy as a pilaf-type main course for lunch or dinner. Thus, wheat wafers were the bulk of every meal but variety was achieved with small amounts of various spreads and sauces.

As usual, on November 4, a Friday, the research team was busy at the shelter from 8 o'clock in the morning. The buses left NRDL at 3:45 in the afternoon and arrived at the shelter shortly before 6 o'clock. At the stroke of six, I began checking the families into the shelter. I was delighted to see that DeeJay, Chris and Cyn had made it to the bus. By 6:15, everyone had gone below, I had closed the door and was explaining the shelter equipment, introducing the cadre, and organizing the sections of tens, keeping families together. Eleanor Taylor began preparations for dinner while the organizing went on. We used arm bands instead of towel vests to carry the identifying number. Every shelteree over twelve years of age was given a job during this organizing process. At 7:30 pm, the first group of 50 sat down to dinner, followed by the second group at 8 o'clock.



The Family Shelter Test
Clockwise from upper left: Entering, exercising, the crowded shelter, getting ready to leave.

After the evening meal, we put up the bunk system, assigned bunks, and put the young children to bed. I noticed that the mothers of the young children and some others chose to retire as well. The older children used their bunks as a place from which to engage in animated discussion with others across the central aisle. By 10:30, most were in the bunks and at eleven the lights were turned down for the night. Because of the size of the cadre, we changed the night watch every two hours. The night was uneventful.

My impression of the family shelter test was mainly of the teenagers and young adults. They were vibrant and resourceful in contrast to the prisoner volunteers in the earlier tests. They instituted exercises for the younger ones and group recreation, such as charades and skit contests, for the adults and themselves. Still very clear in my memory is what happened when I goofed up. I had arranged that at a time unknown to me the topside observers would shut off the electricity, plunging the shelter into darkness. For that reason, I always carried a flashlight with me.

The event occurred on Saturday afternoon. Everything suddenly went pitch-black. Quickly, I called for everyone to remain still, turned on the flashlight and pointed it straight up. You have no idea how black a shelter can be without lights and how effective and comforting the light of a single flashlight reflecting off the metal roof of the shelter can be. I explained that although we had lost power we had an emergency generator in the entryway. I asked them to remain where they were while Don Schultze and I got the generator started. We went into the entryway with the flashlight, leaving the interior door to the shelter open so that a little light would be showing. Then I couldn't get the generator started. I had flooded the carburetor. The odor of gasoline drifted into the shelter. There was a stir of mothers reaching for children and I think we were on the edge of panic. Suddenly, a young lady began to sing. As I remember it, she was singing "America the Beautiful" but it could have been something else. Others joined in, the mothers relaxed and before the song was over I had the generator going and the lights back on.

On Sunday, the last day, we imported a Protestant minister and a Catholic priest into the shelter for services after lunch. At three o'clock, the adults were asked to fill out a questionnaire. At 5:30, there was the ceremony at which each participant got his or her certificate, and at six o'clock, two days after entering, it was all over.

One of the questions on the questionnaire invited the shelterees to comment on their experience in the shelter. My favorite is the following:

"I think the toilets are lovely. I feel that some sort of action should be taken to make the wheat wafers more attractive to the children, i.e., a cheap way of flavoring them (ones to be eaten with peanut butter and jelly). I think the affair was beautifully organized and I noticed that people, after the first day, settled easily into the routine. I brought many things to do but didn't seem able to accomplish anything—I suppose after a time one would become oblivious to the constant noise. I would dearly enjoy being alone."

And, on his way out of the shelter, Dr. Newell, the oldest participant, pressed a piece of paper in my hand, on which was the following:

"The Shelter"
(Sort of a Limerick)

It's a den of noise
Filled with fidgety boys
Our home beneath the firmament
And I'm glad it's a phase
Just lasting two days
Rather than something that's permanent.